UNIT 4:

Responding to Hazards

Overview

This unit provides details on how to prepare to receive a patient(s) and describes the roles and responsibilities of the key team members of an emergency response team. It also provides details on how to prepare an emergency area and how to prepare the emergency response team. You will also review the basic principles of hospital emergency department management, such as patient assessment and triage, treatment of contaminated patients and decontamination procedures. Finally, this unit describes sources of information on hazardous materials.

Objectives

At the conclusion of this unit, you will be able to:

1. Describe some of the key requirements involved in the reception of a patient contaminated or exposed to a hazardous chemical, radiological or etiologic substance.

2. Discuss the functions of various members of the hazardous materials emergency response team.

3. Identify three reasons for the need for special preparation techniques in the emergency area.

4. List at least three ways to prepare the emergency area for receipt of patients to control the spread of hazardous materials and ensure staff safety.

5. Identify suitable personal protection equipment for responding to a hazardous materials incident.

6. Describe the basic procedures for patient assessment and triage.

7. Describe the basic procedures for treatment of a contaminated patient.

8. Identify types of radiological and clinical laboratory assessments required and state reasons why they are required.

9. Describe the purpose of decontamination and the basic components of the decontamination process.

10. Define seven common decontamination mechanisms.

11. List and describe the hospital's hazardous materials information resources and ensure that they are authoritative and up to date.

Pretest

If you think you have the requisite skills and knowledge for this topic area, take the pretest on the next page. If you score at or above the passing range of 85%, skip this unit and proceed to unit five.

UNIT 4: PRETEST

Purpose: This pretest will assess your knowledge about issues and procedures in responding to hazardous materials incidents.

Directions: Read each item and answer accordingly. Each answer counts 20 points. *(If you score at or above the passing range of 85%, skip this unit and proceed to unit five. Do not check the Answer Key (Appendix B) until after you have completed the test.)*

1. When someone or something else comes in contact with someone or something else that has been contaminated, this is known as:
   a) cross contamination
   b) direct contamination
   c) residual contamination
   d) gross contamination

2. Removing a major amount but not all of the contaminant from the contaminated person or object is an example of:
   a) secondary decontamination
   b) gross decontamination
   c) full-stage decontamination
   d) level A decontamination

3. Chemical alteration of a hazardous material into a harmless substance is called _____.
   a) dilution
   b) degradation
   c) disinfection
   d) absorption

4. Which of the following is not a technique for contamination control?
   a) Monitor anyone or anything that leaves the controlled area.
   b) Control ventilation.
   c) Set up a controlled area large enough to hold the anticipated number of victims.
   d) Register all victims at the reception desk before sending them to the decontamination area.

5. List five members of the emergency response team.

Preparing To Receive the Patient

Any hazardous materials event requires a coordinated effort to ensure that all variables are addressed. The emergency response team is an essential component in an effective response, but the initial response begins with accident notification and verification.

Notification and Accident Verification

When the hospital receives a call that a hazardous material incident has occurred and that affected patient(s) will be admitted, the call-taker should get as much information as possible. An effective response cannot occur without accurate and complete information. At a minimum, the following should be standard requirements:

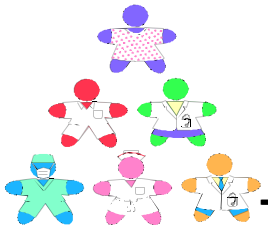
- Number of accident victims
- Each victim's medical status and triage category
- Whether victims have been surveyed for **contamination**
- For radiation incidents, the radiological status of the victims (exposed versus contaminated)
- Identity of contaminant, if known
- Estimated time of arrival
- Call-back number for verification

Medical personnel responding to emergency event calls should assume the victim is contaminated until proven otherwise and base their actions on that assumption. They should advise ambulance personnel of any special entrance requirements.

Contamination vs. Decontamination

Contamination: Substance capable of causing harm to life, health or the environment is physically deposited on the person, animal or object. When the substance (liquid, solid or vapor) actually touches the body or thing, direct or primary contamination occurs. A person or item that has been exposed to a hazardous material is **contaminated** and can contaminate other people or items (called **cross-contamination**). For example, if you enter your car after being exposed to a toxic substance, you will contaminate your car.

Decontamination: The process of removing or neutralizing contaminants that have accumulated on people and equipment.



The Emergency Response Team

The emergency response team consists of a number of individuals, each of whom plays a critical role in a successful response. Though the exact composition of the emergency response team will vary from facility to facility, the following members are usually a part of the emergency response team. In addition, the hospital emergency response team must coordinate its efforts with field personnel and the incident commander involved in handling the events. The composition of the team and the numbers of people needed will vary depending on the magnitude of the response. Team positions may be combined in a smaller scale response. In a large-scale response, the team may need to expand.

Emergency Response Team Members	
Team Member	**Function (Roles and Responsibilities)**
Team Coordinator	Leads, advises, coordinates.
Emergency Physician	Diagnoses, treats and provides emergency medical care; can also function as team coordinator or triage officer.
Triage Officer	Performs triage.
Nurse	Assists physician with medical procedures, collection of specimens, radiological monitoring, where applicable, and decontamination. Assesses patient needs and intervenes appropriately.
Technical Recorder	Records and documents medical data (and, where applicable, specific data regarding hazardous materials).
Safety Officer (or Radiation Safety Officer)	Monitors patient and area and advises on contamination and exposure control; maintains survey equipment.
Public Information Officer	Releases accident information to the media.
Administrator	Coordinates hospital response and assures normal hospital operations.
Security Personnel	Secure the emergency area and control crowds.
Maintenance Personnel	Aid in preparation of the emergency area for contamination control, where applicable.
Laboratory Technician	Provides routine clinical analysis of biological samples and others as required.

Exercise: Who's Responsible for What?

Purpose: To assess your knowledge of the roles and responsibilities of the emergency response team members.

Directions: Match the description with the appropriate team member. *Check your answers in Appendix B. (If you miss any items, review this section before continuing.)*

Role Description	Team Member
_____1. Secures the emergency area and controls crowds	a. Emergency Physician
_____2. Leads, advises, coordinates	b. Public Information Officer
_____3. Diagnoses, treats, and provides emergency medical care	c. Security Officer
_____4. Records and documents medical, hazardous materials, and radiological data	d. Team Coordinator
_____5. Releases accident information to the media	e. Technical Recorder

Preparing the Emergency Area

Upon notification of a hazardous material incident, the emergency response team prepares an area for patient reception. Special preparation techniques protect the attending staff, hospital facility, and equipment, while preventing the spread of contamination outside a designated decontamination area.

Hospitals and medical centers must determine where contaminated patients will be received. Separate ingress routes should be used for patients who are believed to be contaminated than those routes used for other patients. This may require the use of new traffic patterns for incoming vehicles. If different traffic patterns are used, traffic control and routing issues must be resolved through planning systems. Traffic patterns, both foot and vehicle, should be taken into account when designating response areas.

Procedures used in the handling of contaminated victims are similar to strict isolation precautions and to the protocol for "dirty" surgical cases.

Isolation

When contamination is suspected, strict isolation precautions are supplemented with contamination control techniques. This will prevent the spread of contaminants to the hospital environment and staff and simplify cleanup. Respiratory isolation may also be required for some hazardous materials that emit vapors, gases, or dust.

Designated Area for Patient Decontamination (appropriate for all hazards)

It may not be possible for a medical facility to have a dedicated decontamination area that meets basic criteria. In such cases, it may be necessary to improvise a decontamination area. This area should be large enough to hold one or more victims and the necessary medical personnel. Ventilation in the emergency area (EA) can be turned off by the hospital engineering department. Also, return air ducts can be closed or covered with filters. Although airborne contamination is unlikely, its removal from the air-conditioning system would be difficult.

Rolls of brown wrapping paper or butcher paper 3 to 4 feet wide can be unrolled to make a path from the ambulance entrance to the decontamination/treatment room. Ordinary sheet cloths or square absorbent pads (chux) can be used if paper is unavailable. The floor of the decontamination or treatment area should be covered the same way. This route and decontamination area should be marked off and labeled "Emergency Area: Do Not Enter." Whatever the floor covering, it should be taped securely to the floor. All seams should be sealed with tape to prevent tripping or spread of contaminants under the covering. The table on the following page summarizes these contamination control techniques.

All non-essential equipment and supplies in the room should be removed. This will simplify cleanup and decontamination. If a piece of equipment cannot be decontaminated or will be too expensive to decontaminate, it will need to be destroyed as contaminated waste. If it cannot be removed or is essential to patient care, it should be covered if possible. For example, monitor/defibrillator units can be covered with clear plastic sheeting and their screens still be seen. Equipment can be staged outside the room, and quickly brought into the room as the need arises. *Life support and other essential medical equipment and supplies should be available immediately and ready for use.*

Once all equipment and supplies in the room are removed or covered as appropriate, door handles and light switches can be covered by taping plastic sandwich bags or gloves over them to reduce contamination that might be spread by hand. A decontamination table can be prepared in a variety of ways. For example, a standard treatment table can be draped with a waterproof covering—a disposable surgical pack cover from the operating room is ideal. A burn table or specially designed decontamination tray can also be used. If desired, sheets can be rolled lengthwise and placed along the edges of a treatment table, then covered with plastic sheeting formed into a trough for fluid drainage.

Not all equipment can be decontaminated. The straps used on hospital carts cannot be decontaminated effectively and, after use, should be discarded. If wooden backboards are used, they can absorb contamination through scratches in the finish that allow the contamination to access the plywood base. Wooden backboards require either refinishing or replacement after use.

Control Zones

A control zone should be established for the decontamination area. A control line should be set up at the entrance to the EA to differentiate the controlled (contaminated or "hot") area from the noncontrolled (uncontaminated or "cold") area. Once the patient(s) is in the decontamination room, no person or equipment should leave the decontamination area until monitored at this control point for contamination, and decontaminated if needed. The personnel monitoring the control line should also function to limit entrance into the control area to essential personnel and equipment. Remember, if it enters, it is contaminated until proven otherwise, or decontaminated. A third zone (buffer or "warm" zone) can be set up between the contaminated and non-contaminated zone for added security.

Techniques for Contamination Control

The following table summarizes the basic steps that should be followed to control contamination.

Techniques for Contamination Control

1. Set up a controlled area large enough to hold the anticipated number of victims.
2. Prevent tracking of contaminants by covering floor areas.
3. Restrict access to the controlled area.
4. Monitor anyone or anything that leaves the controlled area.
5. Use strict isolation precautions, including protective clothing and bagging.
6. Use a buffer zone or secondary control line for added security.
7. Control waste by using large, plastic-lined containers for clothing, linens, dressings, etc.
8. Control ventilation.
9. Change instruments, outer glovers, drapes, etc. when they become contaminated.
10. Use waterproof materials to limit the spread of contaminated liquids; for example, waterproof aperture drapes.
11. Double bag all waste, contaminated or potentially contaminated objects.

Response Team Preparation (adequate for all hazards)

While the facility is being prepared, the response team members are required to dress in surgical clothing (scrub suit, gown, mask, cap, eye protection and gloves). Waterproof shoe covers should also be used. Pant and shirt cuffs should be taped over shoe covers and gloves; seams and zippers should be sealed with tape to prevent contaminants from getting under garments. A second pair of gloves should be placed over the taped ones. The second pair should be left untaped to allow for frequent glove changes as the outer gloves become contaminated. Other types of personal protective equipment will be required depending on the nature of the hazard.

Personal Protection Equipment (PPE)

The U.S. Environmental Protection Agency has identified four levels of protective ensembles, as described in the table below. The proper protective ensemble should be selected based upon levels of protection from chemical products required by medical staff. In most cases, disposable protective clothing, commonly made from coated Tyvek™ fabrics, is the choice. Common glove fabrics selected include neoprene, nitrile, and PVC materials.

Before using any protective equipment, the medical personnel must be trained in compliance with all applicable OSHA and state standards.

Levels of Personal Protection Equipment

Level A: This level of protection should be worn when the highest level of respiratory, skin, eye, and mucous membrane protection is needed. It consists of fully encapsulating, chemical resistant clothing and self-contained breathing apparatus.

Level B: This level of protection should be used when the highest level of respiratory protection is required, but a lesser level of skin and eye protection is sufficient.

Level C: This level of protection can be used when proper respiratory protection can be afforded by air-purifying, canister-equipped protective breathing devices. It provides the same level of skin protection as Level B, but a lower level of respiratory protection.

Level D: This protective ensemble consists primarily of a standard work uniform. It provides no respiratory protection and affords only minimal skin protection.

Exercise: What Supplies and Personal Protection Equipment Do You Need To Be Prepared To Deal with Potential Hazardous Materials in Your Community?

Directions: Write down the items you would require to deal with the potential hazardous materials you identified in the exercise in Unit 2: *Identify Sources of Hazardous Materials in Your Community.*

Exercise: What's the Appropriate Method To Control the Spread of Hazardous Materials? (Unit 4)

Purpose: To assess your understanding of the techniques used to control contamination.

Directions: Read each item and circle the most appropriate answer. *(You can check your answers in Appendix B. (If you missed any items, review this section before continuing.)*

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1. A wounded patient walks into the reception area. The patient says he just provided assistance at a hazardous materials accident, but was injured when some kind of chemical exploded. What should you do?

(a) Assume the patient is contaminated and immediately direct him or her back outside.
(b) Fill out the patient's information and insurance forms.
(c) Ask the patient to describe the type of accident at which he was providing assistance.
(d) Tell the patient to wait for the next available doctor.

2. You have been notified that you will be receiving 10 patients who have been exposed to some type of corrosive. What should you do first?

(a) Prepare the emergency area.
(b) Contact the security officer to control the crowds.
(c) Notify the public relations officer.
(d) Call the hazardous materials hotline.

3. Which of the following will not help to prevent the spread of contamination in a hospital?

(a) Failure to close the air ventilation ducts in the emergency area.
(b) Establishing a control zone for the decontamination area.
(c) Setting up a warm zone between the contaminated and non-contaminated area.
(d) Using strict isolation precautions including protective clothing.

Hospital Emergency Department Management

Hospitals have rules and procedures that are used to quickly assess and treat patients. In routine situations, these procedures normally work very well. However, in dealing with hazardous materials incidents other variables can come into play that can throw these procedures into havoc. Therefore, you should be familiar with your facility's procedures for dealing with routine and nonroutine emergencies.

Patient Assessment and Triage

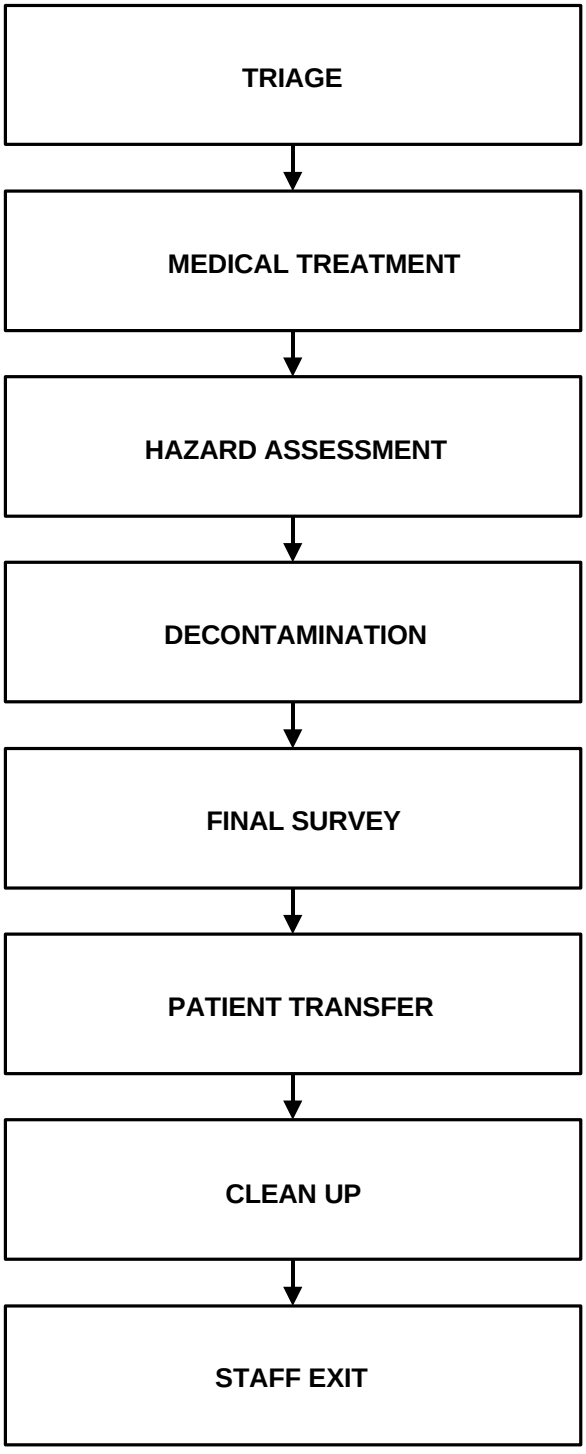
Triage refers to the process used to assess patients and determine the degree of urgency to treat the persons. For hazardous materials incidents, a triage area should be established near the treatment area. Priority should be given to medical and, when applicable, radiological problems. *Serious medical problems always have priority over other concerns, such as radiological exposure.* Therefore, in most cases, immediate assessment of the victim's airway, breathing, and circulation should be made and any necessary lifesaving measures performed. You should adhere to the "standard of care" rules dictated by your hospital.

Treatment of the Contaminated Patient

Noncontaminated patients can be cared for like any other emergency cases. The victim of exposure without contamination does not pose a threat to anyone. Contaminated patients should be taken immediately to a decontamination area for treatment. Good judgment is essential in determining decontamination priorities. Since some chemicals are corrosive or toxic, medical attention might have to be directed first to those problems.

For example, a basic overview of the procedures for treating contaminated patients who have been exposed to radiation is shown below. Most of the procedures are similar for non-radiation exposed patients also, but you will not need to perform a radiological assessment. However, you may need to perform other assessments based on the information received from technical sources such as the Material Safety Data Sheets (MSDS) or the Agency for Toxic Substances and Disease Registry (ATSDR).

Example: The Emergency Care of the Contaminated Injured Patient



Laboratory Assessments

Types of Assessments

As with any situation, a complete and detailed medical, occupational, and accident history should be taken, and a physical examination completed. Certain clinical and laboratory analyses are also essential. A summary of some of the required samples appears in the table below.

Reasons for Assessments

These laboratory tests are performed to assess the biological effects, to identify abnormalities, to quantify radionuclide contamination if incident involves radioactive material, and to provide information useful in accident analysis. All samples collected should be labeled with date, time and exact site of collection such as "left nostril" in addition to patient name, number, etc.

Clinical and Laboratory Assessments

SAMPLES NEEDED	WHY	HOW
In all cases of radiation injury: Complete blood count and differential STAT (follow with absolute lymphocyte counts every 6 hours for 48 hours when history indicates possibility of total-body irradiation)	For radiation exposures, to assess the radiation dose; initial counts establish a baseline, subsequent counts reflect the degree of injury	Choose a noncontaminated area for veni-puncture; cover puncture site after collection
Routine urinalysis	To determine if kidneys are functioning normally and establish a baseline of urinary constituents; especially important if internal contamination is a possibility. Certain radioisotopes excrete or concentrate in urine.	Avoid contaminating specimen during collection; if necessary, give the patient plastic gloves to wear for collection of specimen; label specimen "Number 1," with date and time
When external contamination is suspected:		
Swabs from body orifices	To assess possibility of internal contamination	Use separate saline- or water-moistened swabs to wipe the inner aspect of each nostril, each ear, mouth, etc.

Swabs from wounds	To determine if wounds are contaminated	Use moist or dry swabs to sample secretions from each wound, or collect a few drops of secretion from each using a dropper or syringe. For wounds with visible debris, use applicator or long tweezers or forceps to transfer samples to specimen containers which are placed in lead storage containers
Skin wipes	To locate contaminated areas	Use filter paper, smear pads, or compresses to wipe sample areas 10 cm x 10 cm in size
When internal contamination with radioactive material is suspected:		
Urine: 24-hour specimen x 4 days	Body excreta may contain radionuclides if internal contamination has occurred	Use 24-hour urine collection container
Feces x 4 days	Body excreta may contain radionuclides if internal contamination has occurred	Save excreta in plastic containers in refrigerator or freezer
Vomitus	Body excreta may contain radionuclides if internal contamination has occurred	Save excreta in plastic containers in refrigerator or freezer
Sputum	To assess respiratory tract contamination if inhalation of contaminant was a possibility	Use 5-percent propylene-glycol aerosol to get a deep cough specimen for radiation victims
Serum creatinine, BUN	To assess kidney function if chelation is indicated	Clinical chemistry
***Other samples needed**:*		
All irrigating fluids	Radiological and hazardous materials assessment	Save in sealed and labeled, glass- or plastic-lined containers

Exercise: Why Do I Need a Sample?

Purpose: To assess your knowledge about why certain samples are required.

Directions: Match the correct sample with the reason it is required.
(Check your answers in Appendix B after you have finished. If you miss any, review this section again before proceeding.)

Sample	Reason Required
____1. Routine urinalysis	a. In accidents involving radiation, to assess the radiation dose and
____2. Swabs from wounds	b. To assess respiratory tract contamination if inhalation of contaminant was a possibility
____3. Sputum	c. To determine if wounds are contaminated
____4. Serum creatinine	d. To assess kidney function if chelation is indicated
____5. Complete Blood Count	e. To determine if kidneys are functioning normally

Job Aid

The following table lists some basic supplies needed to prepare the emergency department for the care of the contaminated patient.

Sample Supplies and Equipment Needed To Prepare the Emergency Department for the Care of the Contaminated Patient	
• Brown wrapping paper • Masking tape • Rope • Caution Radiation Area signs • Decontamination table • 5-gallon containers for wash water • Large waste containers lined with plastic bags • Cotton-tipped applicators • Various sizes of plastic bags • Small lead storage containers • Sterile saline • Sterile water • Sodium hypochlorite or household bleach • Providone iodine solution or other surgical soap • Soft scrub brushes • 3-percent hydrogen peroxide solution	• Shampoo • Emergency medical supplies and equipment (such as suction, oxygen, airways intubation, IV solutions, etc.) • Scrub suits • Gowns • Surgical hoods • Masks • Surgical gloves of various sizes • Waterproof shoe covers • Film badges • Dosimeters and/or survey meters • Rubber or plastic aprons • Batteries • Wax or felt tip pens • Radioactive labels • Sheets, blankets, towels, patient gowns

Introduction to Decontamination

Proper decontamination is important in responding to hazardous materials incidents. Quick actions can prevent the spread of the chemical or vapors and can help to save lives.

Purpose of Decontamination

Decontamination is performed for the following reasons:

- To reduce skin damage and the absorption factor of the contaminant through the skin
- To minimize the chance of inhalation or ingestion
- To protect the health of medical care providers
- To control the spread of contamination to equipment and facilities
- To determine damage done by the hazardous material

Mechanisms for Decontamination

There are seven common mechanisms for performing **gross** and **secondary decontamination**: emulsification, chemical reaction, disinfection, dilution, absorption, removal and disposal.

Gross decontamination is the removal or chemical alteration of the majority of the contaminant. It must be assumed that some residual contamination will remain on the host. This residual contamination can produce cross-contamination.

Secondary decontamination is the removal or alteration of most of the residual product contamination. It provides a more thorough decontamination than the gross effort. However, some contaminant may still remain.

Mechanisms for Decontamination

Emulsification. This is the production of a suspension of ordinarily immiscible/insoluble materials, using an emulsifying agent such as a surfactant, soap, or detergent. Emulsification is most often used for nonpolar liquids and insoluble solids.

Chemical Reaction or Degradation. This is a process that neutralizes, degrades, or otherwise have been eliminated, and the reactions can be both difficult and dangerous to perform. It is, therefore, not recommended for use on living tissue.

Disinfection. This process removes the biological (etiologic) contamination hazards as the disinfectant destroys microorganisms and their toxins. It is the method of choice for many biohazards. Bleach and hydrogen peroxide are commonly used products.

Dilution. This process simply reduces the concentration of the contaminant. It is most commonly used for those substances that are miscible/soluble. Huge quantities of solvent may be required to dilute even small volumes of some solute contaminants. You must exercise caution with products that are water reactive because chemical or thermal burns on the patient may occur in some cases. *Know the product before you act.* This method may not be effective with nonwater-soluble materials that may require other agents.

Absorption. This is the penetration of a liquid or gas into another substance. A classic example of this process is when a sponge absorbs water. This method has no practical role in the decontamination of victims. This is generally used for large-scale removal of contaminants from the environment, such as from the surface of water.

Removal. This is the physical process of removing contaminants by pressure or vacuum. Most efforts involve the use of water, though some solids can be removed with brushes and wipes, and even air can be used. You must take special precautions to avoid inhaling the airborne dusts and vapors while performing mechanical removal.

Disposal. This process is the aseptic removal of a contaminated object (personal protective equipment, other equipment, etc.) from a host, after which the object is directly disposed. The host object is never really decontaminated. It is not the method of choice in dealing with patients, but is likely to be used in dealing with the contaminated clothing of victims and emergency workers.

Exercise: What Do You Know About Mechanisms for Decontamination?

Purpose: To assess your knowledge of ways to perform gross and secondary decontamination.

Directions: Match the descriptions of decontamination mechanisms with the appropriate terms. *(Check your answers in Appendix B. If you miss any items, review this section before proceeding.)*

Description	Term
____1. Process that neutralizes, degrades, or otherwise chemically alters the contaminant.	a. Absorption
____2. Destroys microorganisms and their toxins.	b. Dilution
____3. Penetration of liquid or gas into another substance.	c. Disposal
____4. Used more often to deal with contaminated clothing.	d. Degradation
____5. Reduces the concentration of the contaminant.	e. Disinfection

Methods for Decontamination

There are two basic methods of decontamination: dry and wet. Though a contaminant may or may not be liquid, dry methods are an effective means of decontamination. These include the mechanisms of disposal and absorption, which use no liquids. Equipment may be vacuumed, or disposable outer suit coverings may be worn, providing what is known as double enveloping.

Nonwater-Based Methods

Nonwater-based solutions, like those used for degradation operations, are contaminant-specific. In general, they are used for equipment only, because they are hydrocarbon and halogenated hydrocarbon compounds.

Wet Methods

Wet methods, though they may have some dry operational steps, principally involve the use of liquids. Wet methods are used in emulsification and dilution operations. The wet solutions may be either water-based or nonwater-based. The water-based solutions may function as emulsifiers, neutralizers, degraders, or disinfectants.

Emulsifiers have a "loosening" effect on the bonding nature of a contaminant. Laundry detergent, preferably liquid, is an example of an emulsifying agent. Trisodium phosphate is another example, but it is deemed too harsh because of its capacity to destroy the protective qualities of PPE. In itself it is a potential hazard to the environment.

Neutralizers are used to negate the destructive forces of either an acid or a base (caustic or alkaline). Sodium carbonate or the like might be used to neutralize an acid. Large amounts of heat may be generated.

Degradation Solutions may be quite complex, as they often must be contaminant-specific. This means that general answers cannot be offered. Specific solutions to a given problem may require the use of chemical and/or biological agents. In one instance, chemical oxidation or reduction may solve a problem. In another case, enzymes or microbial agents may be necessary.

Disinfection Procedures, such as the use of chlorine bleach, are also a means of decontamination.

The decontamination mechanisms of disinfection, chemical reaction, and removal all may occur through either a wet or dry method. The specific procedure for decontamination will vary according to the chemical to which the individual was exposed. Certain items—for example, leather and some plastic and rubber materials—absorb toxic substances so easily that they cannot be completely decontaminated; these items must be discarded or disposed of.

Decontamination Process

In all cases, it is important to attend to lifesaving needs before beginning decontamination.
In most instances, contaminated wounds and orifices are decontaminated first, followed by areas of highest contamination levels on intact skin. Decontamination should begin with the least aggressive method and progress to more aggressive ones. You will learn more about decontamination in the classroom course.

The decontamination process consists of the following steps:

Step 1—Remove gross decontamination from the patient.
Step 2—Treat patient's medical needs.
Step 3—Fully clean the patient.
Step 4—Decontaminate staff after treatment is completed.
Step 5—Decontaminate facility.

Hazardous Materials Resources

There are numerous resources available to help hospital personnel deal with hazardous materials incidents. Some of the more important resources are described below.

Written Information and Publicly Available On-line Database Sources

Material Safety Data Sheet (MSDS). Chemical manufacturers and importers must develop a Material Safety Data Sheet (MSDS) for each hazardous chemical they produce or import. Each MSDS includes information regarding the specific chemical identity of the hazardous chemical(s) involved and the common names. In addition, it provides:

- information on the physical and chemical characteristics of the hazardous chemical;
- known acute and chronic health effects and related health information;
- exposure limits;
- whether the chemical is considered a carcinogen by the National Toxicology Program, IARC, or OSHA;
- precautionary measures;
- emergency and first aid procedures; and
- the identification of the organization responsible for preparing the sheet.

These MSDS sheets are also available in computerized formats and through on-line databases. *Check to see if your facility has copies of or access to the MSDS.*

The Emergency Response Guidebook for Selected Hazardous Materials, U.S. Department of Transportation. This is a good resource to help identify hazardous materials. However, it does not provide information on treatment for people exposed to the hazardous materials. This book is more useful for field personnel than for hospital staff.

Recognition and Management of Pesticide Poisoning by the Environmental Protection Agency. This document concentrates on pesticide poisonings and provides good information on decontamination activities and treatment protocols.

Chemical Hazards Information Response System (CHRIS), produced by the U.S. Coast Guard, provides information for emergency response during transport of hazardous chemicals. Contains information on labeling, physical and chemical properties, fire hazards, chemical reactivity, water pollution, and hazard classifications for more than 1,016 substances.

TOXNET system is a computer database operated by the National Library of Medicine. Your facility can preregister with TOXNET for system access. TOXNET printouts provide extensive information on chemical substances. The Hazardous Substance Database, part of the TOXNET system, includes a POISINDEX® protocol for patient care and treatment.

Sources of Assistance

Joint Commission on Accreditation of Healthcare Organizations (JCAHO) establishes standards for hospital accreditation. Some of these standards are related to minimum standards for responding to hazardous materials events and for identifying and controlling hazardous materials in the facility.

Occupational Safety and Health Administration (OSHA) provides information on interpreting the OSHA requirements and on meeting the applicable standards.

National Institute for Occupational Safety and Health (NIOSH) provides printed material related to employee safety and health in the workplace.

The Chemical Emergency Transportation Center (CHEMTREC) is a public service operated by the Chemical Manufacturers Association. CHEMTREC can provide valuable assistance in identifying chemical substances and can provide telephone conference connections with the manufacturer or representatives of the materials in question. Many chemical manufacturers have toxicologists who can be reached through the CHEMTREC network. There is no charge for the services of this organization.

Agency for Toxic Substances and Disease Registry (ATSDR) operates a telephone hotline for information on chemical exposures. This telephone service can provide medical personnel with valuable information on treatment protocols, therapies, decontamination methods, and other related topics. There is no charge for their services.

Local or Regional Poison Control Centers can provide information on the treatment and toxicity of many substances. They also usually have a toxicologist available for consultation on a 24-hour basis.

There are numerous other sources that you can consult, such as your local emergency management office and local colleges and universities.

Exercise: Identify Sources of Assistance and Information

Purpose: To assess your knowledge of sources of assistance and information regarding hazardous materials.

Directions: List five sources of assistance and information regarding hazardous materials. At least one source should be a local entity.

1.

2.

3.

4.

5.

References

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FEMA, EMI. 1984. *Hospital Emergency Department Management of Radiation Accidents.* Emmitsburg, MD (out of print).

UNIT 4: POST-TEST

Directions: Answer each of the questions below.

(*Check your answers in Appendix B. If you missed any items, you should review this unit before proceeding.*)

1. When notified of a hazardous materials incident and the possible transport of patients, what should you do?

   a) Get accurate and complete information from the person reporting the incident.
   b) Call the local emergency management office to coordinate patient treatment.
   c) Notify the American Red Cross.
   d) Wait until the patients arrive before taking any action.

2. When a substance actually touches a body or thing, it is called

   a) Cross contamination
   b) Decontamination
   c) Direct or primary contamination
   d) Contaminated

3. Which of the following statements is not a characteristic of the emergency response team (ERT)?

   a) The composition of the ERT may vary from facility to facility.
   b) The hospital ERT must coordinate its efforts with field emergency response teams and other external agencies.
   c) The composition of the team, and the numbers of people needed will vary according to the magnitude of the situation.
   d) The ERT consists of a limited number of people, usually the triage officer, nurse, and emergency physician.

4. It is important to prepare an emergency area when dealing with hazardous materials incidents because:

   a) Special preparation techniques protect the attending staff, hospital facility, and equipment while preventing the spread of contamination.
   b) It will be easier for family members to see the patient.
   c) Doctors and nurses prefer to work in separate areas.
   d) It allows for continuous traffic flow and visitor movement within the area.

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5. Protocol for "dirty" surgical cases is similar to the techniques applied in:

   a) Treating ill patients
   b) Isolation of contaminated patients
   c) Diagnosing wounded patients
   d) Triage

6. To prepare a room for decontamination, you should:

   a) Turn off the ventilation system.
   b) Cover the movable equipment.
   c) Set up an open access area.
   d) Avoid using control lines or control zones.

7. Personal protection equipment should only be used when

   a) Personnel have been trained in the OSHA requirements regarding its use
   b) Poisonous vapors are present
   c) Instructed to do so by the ERT coordinator
   d) You perceive a danger

8. In dealing with hazardous materials incidents during patient assessment and triage

   a) You should follow routine procedures in all situations.
   b) You should care for noncontaminated patients like any other emergency case.
   c) You should take all patients to a decontamination area.
   d) You should wait until you have details on the nature of the hazard before doing anything.

9. Which of the following is *not* a reason you perform radiological and clinical laboratory assessments:

   a) To assess the biological effects
   b) To identify abnormalities
   c) To quantify radionuclide contamination, if exposed to radiation
   d) To aid in the detection of the hazard

10. When you perform gross decontamination, you

    a) Remove or alter chemically the majority of the contaminant
    b) Remove all traces of the contaminant
    c) Ensure that cross contamination does not occur
    d) Create potential hazards